

Appl. No : 10/043,483
Amdt. dated : 11/13/03
Reply to Office Action of 11/05/03

Amendments to the Specification:

1) page 1, first paragraph, please replace this paragraph with the following amended text:

The invention relates to the fabrication of integrated circuit devices, and, more particularly, to a method for making vertical and negative profiles in ~~[[the]]~~ a patterned ~~[[of a]]~~ layer of photoresist.

2) page 13, the last paragraph, page 14, the first paragraph, please replace this paragraph with the following amended text:

The temperature profile that is established throughout layer 22 of photoresist is shown in Fig. 2c, from which can be learned that the highest temperature exists in regions 21 since these regions are located closest to hot plate ~~[[12]]~~ 10. The temperature internal to the layer of photoresist 22 is shown along the horizontal or X-axis, the distance in a perpendicular direction to wafer 12 is indicated along the vertical or Y-axis. It therefore stands to reason that the photoresist will first reflow in these regions 21. At the time that the reflow takes

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place, the photoresist is pulled down by the gravity force 18 ~~in~~
~~the direction of the original sidewalls 15~~ and is removed from
the highlighted regions 21 and from where the photoresist will
accumulate accumulates in regions 23.

3) page 14, the last paragraph, page 15, the first paragraph,
please replace this paragraph with the following amended text:

From the cross section that is shown in Fig. 2b, two
observations are in place:

- the positive profile of the opening 26 through the layer 22 of photoresist, where sidewalls 28 of an opening 26 through the layer 22 of photoresist slope outwards when proceeding from the bottom to the top of the opening, has been converted to a negative profile, where sidewalls 30 of an opening 26 through the layer 22 of photoresist slope inwards when proceeding from the bottom to the top of the opening
- by control of temperature and time of exposure to the temperature, it is possible to convert a positive profile to a vertical profile, where sidewalls of an opening through the layer of photoresist intersect under an angle of essentially 90 degrees with the surface of the wafer, and

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- a combination of negative and vertical profile can be created
- the cross section of the opening 26 where this opening exists layer [[2]] 22 has been reduced in size, thus enabling closer spacing of adjacent holes.

4) page 16, after the first paragraph, and before the paragraph that starts with : "Although the invention has been described . . . ", please add the following new paragraph. Support for this new text is provided in the description of Figs. 2A and 2B of the specification, starting in the last paragraph of page 12.

The invention, which provides a method of modifying a slope of sidewalls of openings created in a layer of photoresist, can additionally be summarized as follows:

- providing a substrate, the substrate having been provided with semiconductor devices, at least one layer of semiconductor material having been deposited over the substrate, the at least one layer of semiconductor material being patterned for creation of additional functional capabilities of the semiconductor devices
- coating a layer of photoresist over the at least one layer of semiconductor material

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- patterning the layer of photoresist, creating at least one opening through the layer of photoresist having sidewalls, the at least one opening comprising a via hole and an interconnect line trench
- providing a hot plate having a first and a second surface
- mounting the substrate on the second surface of the hot plate, the second surface facing in about an upward direction
- placing the hot plate in about an upwards-down position, thereby facing the second surface of the hot plate in about a downwards direction, the second surface of the hot plate being about parallel with a horizontal plane, the horizontal plane coinciding with a plane of the earth's surface
- applying energy in the form of heat to the hot plate, thereby supplying energy in the form of heat to the substrate and to the patterned layer of photoresist created over the substrate, the energy being applied for a first period of time
- discontinuing the application of energy in the form of heat, thereby discontinuing supplying energy in the form of heat to the substrate and to the patterned layer of photoresist, the discontinuing being applied for a second period of time
- placing the hot plate in about an upwards position, thereby facing the second surface of the hot plate in about an

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upwards direction, the second surface of the hot plate being about parallel with a horizontal plane, the horizontal plane coinciding with the plane of the earth's surface, creating a modified layer of photoresist having openings of modified slopes of sidewalls of the openings, and

- continuing with conventional processing, using the modified layer of photoresist for the patterning of the at least one layer of semiconductor material.